Quality of Western Canadian Wheat Exports

August 1, 1996, to January 31, 1997

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ISSN 1203-794X
Cargo Bulletin No. 281

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Table of Contents

Introduction

Canada Western Red Spring Red Spring wheat

Canada Western Amber Durum wheat

Canada Western Red Winter wheat

Canada Prairie Spring Red and White wheat

Canada Western Extra Strong wheat

Canada Western Soft White Spring wheat

Methods and definitions

Introduction

This bulletin reports quality data for cargoes of all classes of western Canadian wheat exported by ship from August 1, 1996, to January 31, 1997. Three types of information are presented:

- Distribution tables for moisture content, test weight and other grade determining factors assessed during grading of individual cargoes by Industry Services, Canadian Grain Commission, at time of vessel loading.

- Quality data (wheat and flour characteristics, milling, end-use quality) for weighted composite samples that represent all cargoes of a given grade (and protein segregate where appropriate) exported during the six-month period. For Canada Western Red Spring wheat, composites representing Atlantic and Pacific shipments are prepared and tested. For the other wheat classes, only one series of composites represents all cargoes (Atlantic and Pacific) exported from Canada during the period.

- Pilot milling and baking data for No. 1 Canada Western Red Spring wheat-13.0% protein content segregate. Composites for each quarter are tested. Each of the two composites is a weighted representation of all cargoes (Atlantic and Pacific) exported during that quarter of the crop year.

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Quality of Western Canadian Wheat Exports
August 1, 1996, to January 31, 1997

Canada Western Red Spring wheat

Canada Western Red Spring (CWRS) wheat is well known for its excellent milling and baking quality. Three milling grades are available, the top two of which are further segregated according to protein content. Guaranteed minimum protein content is reported on a 13.5% moisture basis.

Higher protein CWRS wheat is highly suitable for blending and for the production of high volume pan breads. It is also commonly used alone or in blends with softer wheats for the production of hearth breads, steamed breads, noodles, flat breads and common wheat pasta.

To qualify for the milling grades in this class, wheat must be a registered variety--a variety equal in quality to the statutory standard, Neepawa. Varietal standards and registration ensure that a high degree of uniformity in quality is maintained in export shipments.

Canada Western Red Spring wheat
Tables and Figures

Table 1. Moisture content, test weight and other grade determining factors, Atlantic export cargoes of Canada, Western Red Spring wheat, First and second quarter 1996-97

Table 2. No. 1 Canada Western Red Spring wheat, Altantic export cargo composites, First and second quarters 1996-97

Table 3. No 2. Canada Western Red Spring wheat, Atlantic export cargo composites, First and second quarters 1996-97

Table 4. No 3.Canada Western Red Spring wheat, Atlantic export cargo composites, First and second quarters 1996-97. No cargoes shipped

Table 5. Moisture content, test weight and other grade determining factors, Pacific export cargoes of Canada Western Red Spring wheat, first and second quarters 1996-97

Table 6. No. 1 Canada Western Red Spring wheat, Pacific export cargo composites, First and second quarters 1996-97

Table 7. No. 2 Canada Western Red Spring wheat, Pacific export cargo composites, First and second quarters 1996-97

Table 8. No. 3. Canada Western Red Spring wheat, Pacific export cargo composites, First and second quarters 1996-97

Milling and baking quality GRL pilot mill

Figure 1. Cumulative ash curves for pilot mill flour

Table 9. No. 1 Canada Western Red Spring 13.0 wheat, Export cargo composites, Pilot mill flour data - First and second quarters 1996-97

Table 10. No. 1 Canada Western Red Spring 13.0 wheat, Export cargo composites, Pilot mill flour baking data - First and second quarters 1996-97

Back to the Table of Contents

different for different seasons.

Tables 1 to 3

Table 1 • Moisture content, test weight and other grade determining factors*
Atlantic export cargoes of Canada Western Red Spring wheat
First and second quarters 1996–97

	No. 1 CWRS							No. 2 CWRS				
	Guaranteed minimum protein content											
	14.5	14.0	13.5	13.0	12.5	12.0	11.5	14.5	14.0	13.5	13.0	11.5
Number of cargoes	20	2	24	2	6	1	1	1	2	7	4	1
Thousands of tonnes	164	12	218	22	35	26	17	14	33	100	62	11
Moisture content, %												
Weighted mean	13.6	14.0	13.7	13.7	13.9	13.4	13.1	14.1	14.0	13.8	13.6	13.5
Standard deviation	0.3	0.2	0.2	0.1	0.2	..	..	..	0.4	0.3	0.3	..
Minimum	12.7	13.8	13.2	13.7	13.6	13.4	13.1	14.1	13.7	13.5	13.4	13.5
Maximum	14.1	14.1	13.9	13.8	14.1	13.4	13.1	14.1	14.2	14.1	14.0	13.5
Test weight, kg/hl												
Weighted mean	80.7	81.0	81.7	81.3	81.9	82.5	82.4	79.3	80.0	80.9	80.0	81.7
Standard deviation	1.0	0.9	0.8	0.6	0.6	..	..	..	1.4	1.1	0.7	..
Minimum	79.2	80.1	79.9	81.0	81.0	82.5	82.4	79.3	78.9	78.6	79.5	81.7
Maximum	82.1	81.4	82.6	81.9	82.6	82.5	82.4	79.3	80.9	81.5	80.8	81.7
Wheats of other classes, %												
Weighted mean	0.26	0.18	0.33	0.49	0.38	..	0.28	0.41	0.50	0.40	0.69	0.40
Cereal grains other than wheat, %												
Weighted mean	0.15	0.22	0.20	0.20	0.18	0.21	0.13	0.34	0.31	0.27	0.26	0.30

* Canadian Grain Commission, Industry Services data for official loading samples tested at time of loading

Methods used at the Grain Research Laboratory

Back to Canada Western Red Spring wheat list of tables and figures

Table 2 • No. 1 Canada Western Red Spring wheat
Atlantic export cargo composites
First and second quarters 1996–97

	No. 1 CWRS						
	Guaranteed minimum protein content						
Quality parameter*	14.5	14.0	13.5	13.0	12.5	12.0	11.5
Wheat							
Weight per 1000 kernels, g	30.4	31.2	31.4	31.3	31.7	32.6	33.1
Protein content, %	14.9	14.2	13.7	13.2	12.7	12.2	11.8
Protein content, % (dry matter basis)	17.2	16.4	15.8	15.3	14.7	14.1	13.6
Ash content, %	1.68	1.61	1.67	1.59	1.61	1.59	1.55
α-amylase activity, units/g	6.0	7.0	6.5	6.5	6.5	9.0	8.5
Falling number, s	405	403	395	400	395	375	370
PSI	55	56	53	53	56	53	52
Milling							
Flour yield							
Clean wheat basis, %	75.0	75.2	74.8	75.2	75.1	75.1	75.0
0.50% ash basis, %	73.5	74.2	73.8	74.7	76.6	74.6	75.0
Flour							
Protein content, %	14.3	13.8	13.2	12.6	12.3	11.6	11.2
Wet gluten content, %	39.3	37.1	35.6	33.9	32.9	31.2	30.0
Ash content, %	0.53	0.52	0.52	0.51	0.47	0.51	0.50
Grade colour	-1.1	-1.3	-1.6	-1.9	-1.8	-2.1	-2.2
AGTRON colour, %	62	62	65	67	68	69	70
Starch damage, %	5.2	5.9	6.2	6.1	6.4	6.4	6.9
α-amylase activity, units/g	1.0	1.0	1.5	2.0	1.0	1.0	1.0
Amylograph peak viscosity, BU	795	770	735	720	785	710	725
Maltose value, g/100 g	1.8	1.9	2.0	2.1	2.2	2.3	2.4
Zeleny sedimentation, ml	71	70	69	67	65	63	61
Farinogram							
Absorption, %	65.0	64.4	64.6	64.2	64.4	64.6	64.9
Development time, min	5.75	5.25	5.0	4.75	4.5	4.75	4.5
Mixing tolerance index, BU	25	30	30	30	30	30	30
Stability, min	10.5	10.0	10.5	9.0	9.5	8.5	8.0
Extensigram							
Length, cm	23	23	22	22	21	19	18
Height at 5 cm, BU	300	265	290	280	300	315	305
Maximum height, BU	505	505	510	470	495	510	485
Area, cm^2	165	155	150	140	140	130	120
Alveogram							
Length, mm	158	137	137	119	109	79	74
P (height x 1.1), mm	84	83	94	99	102	122	131
W, x 10^3 ergs	413	353	386	376	363	340	334
Baking (Canadian Short Process Baking Test)							
Absorption, %	69	68	69	68	68	69	69
Mixing energy, W-h/kg	8.1	9.4	8.1	7.5	8.0	7.8	7.3
Mixing time, min	7.6	7.8	7.8	8.4	7.5	7.7	7.1
Loaf volume, cm^3/100 g flour	1120	1105	1080	1080	1060	1010	995

* Unless otherwise specified, data are reported on a 13.5% moisture basis for wheat and a 14.0% moisture basis for flour.

Methods used at the Grain Research Laboratory

Back to Canada Western Red Spring wheat list of tables and figures

Table 3 • No. 2 Canada Western Red Spring wheat
Atlantic export cargo composites
First and second quarters 1996–97

	No. 2 CWRS				
	Guaranteed minimum protein content				
Quality parameter*	14.5	14.0	13.5	13.0	11.5
Wheat					
Weight per 1000 kernels, g	30.8	31.1	31.6	31.0	32.9
Protein content, %	14.6	14.2	13.8	13.1	11.8
Protein content, % (dry matter basis)	16.9	16.4	16.0	15.1	13.6
Ash content, %	1.72	1.68	1.66	1.58	1.69
α-amylase activity, units/g	8.5	7.5	7.5	9.5	8.0
Falling number, s	365	390	395	380	385
PSI	57	56	55	55	51
Milling					
Flour yield					
Clean wheat basis, %	75.8	75.6	74.8	75.6	75.5
0.50% ash basis, %	74.3	74.6	74.3	74.6	74.5
Flour					
Protein content, %	14.1	13.6	13.2	12.5	11.2
Wet gluten content, %	38.9	37.1	35.6	34.3	29.7
Ash content, %	0.53	0.52	0.51	0.52	0.52
Grade colour	-0.9	-1.1	-1.5	-1.7	-1.9
AGTRON colour, %	61	61	65	67	67
Starch damage, %	6.4	6.2	6.1	6.4	7.4
α-amylase activity, units/g	1.5	1.5	1.5	2.5	1.0
Amylograph peak viscosity, BU	650	655	690	665	645
Maltose value, g/100 g	2.1	2.1	2.2	2.3	2.6
Zeleny sedimentation, ml	68	69	67	63	55
Farinogram					
Absorption, %	65.7	65.3	64.9	64.7	63.7
Development time, min	4.75	5.5	5.25	4.5	4.25
Mixing tolerance index, BU	30	30	30	30	30
Stability, min	8.0	9.5	9.0	8.0	7.5
Extensigram					
Length, cm	25	23	23	21	19
Height at 5 cm, BU	210	280	290	280	280
Maximum height, BU	370	480	490	460	420
Area, cm^2	125	155	150	135	110
Alveogram					
Length, mm	140	146	128	109	70
P (height x 1.1), mm	89	92	97	103	136
W, x 10^3 ergs	383	409	392	366	334
Baking (Canadian Short Process Baking Test)					
Absorption, %	70	69	69	69	70
Mixing energy, W-h/kg	6.8	8.4	8.4	8.4	6.6
Mixing time, min	6.4	7.6	8.0	8.3	10.1
Loaf volume, cm^3/100 g flour	1095	1075	1065	1085	985

* Unless otherwise specified, data are reported on a 13.5% moisture basis for wheat and a 14.0% moisture basis for flour.

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Back to Canada Western Red Spring wheat list of tables and figures

Back to

1. Canada Western Red Spring wheat list of tables and figures
2. Quality of Western Canadian Wheat Exports table of contents

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EXPORT QUALITY REPORTS

Quality of Western Canadian Wheat Exports
August 1, 1996, to January 31, 1997

Canada Western Red Spring wheat

Tables 4 - 6

Table 4 • No. 3 Canada Western Red Spring wheat
Atlantic export cargo composites
First and second quarters 1996–97

Quality parameter*	No. 3 CWRS Not segregated by protein content
Wheat	
Weight per 1000 kernels, g	
Protein content, %	
Protein content, % (dry matter basis)	
Ash content, %	
α-amylase activity, units/g	
Falling number, s	
PSI	
Milling	
Flour yield	
Clean wheat basis, %	
0.50% ash basis, %	
Flour	
Protein content, %	
Wet gluten content, %	
Ash content, %	
Grade colour	
AGTRON colour, %	
Starch damage, %	
α-amylase activity, units/g	
Amylograph peak viscosity, BU	
Maltose value, g/100 g	
Zeleny sedimentation, ml	
Farinogram	
Absorption, %	
Development time, min	
Mixing tolerance index, BU	
Stability, min	
Extensigram	
Length, cm	
Height at 5 cm, BU	
Maximum height, BU	
Area, cm^2	
Alveogram	
Length, mm	
P (height x 1.1), mm	
W, x 10^3 ergs	
Baking (Canadian Short Process Baking Test)	
Absorption, %	
Mixing energy, W-h/kg	
Mixing time, min	
Loaf volume, cm^3/100 g flour	

NO CARGOES SHIPPED

* Unless otherwise specified, data are reported on a 13.5% moisture basis for wheat and a 14.0% moisture basis for flour.

Methods used at the Grain Research Laboratory

Back to Canada Western Red Spring wheat list of tables and figures

Table 5 • Moisture content, test weight and other grade determining factors*
Pacific export cargoes of Canada Western Red Spring wheat
First and second quarters 1996–97

	No. 1 CWRS						
	Guaranteed minimum protein content						
	14.5	14.0	13.5	13.0	12.5	12.0	11.5
Number of cargoes	1	1	4	42	10	4	4
Thousands of tonnes	2	6	52	786	252	106	63
Moisture content, %							
Weighted mean	11.8	12.0	13.0	13.2	13.4	13.2	12.7
Standard deviation	–	–	0.7	0.5	0.5	0.2	0.5
Minimum	11.8	12.0	12.6	11.8	12.5	12.9	12.5
Maximum	11.8	12.0	14.0	14.1	14.0	13.3	13.6
Test weight, kg/hl							
Weighted mean	81.8	81.9	82.4	82.7	82.7	82.3	83.0
Standard deviation	–	–	0.4	0.6	0.6	0.4	0.5
Minimum	81.8	81.9	82.2	80.5	81.9	82.1	82.4
Maximum	81.8	81.9	83.0	83.3	83.6	83.0	83.5
Wheats of other classes, %							
Weighted mean	0.20	0.16	0.34	0.27	0.25	0.43	0.30
Cereal grains other than wheat, %							
Weighted mean	0.13	0.21	0.18	0.18	0.18	0.15	0.12

	No. 2 CWRS						No. 3 CWRS
	Guaranteed minimum protein content						
	14.0	13.5	13.0	12.5	12.0	11.5	
Number of cargoes	5	5	3	13	7	4	14
Thousands of tonnes	42	46	19	254	145	65	356
Moisture content, %							
Weighted mean	13.4	13.9	13.3	13.6	13.3	13.1	14.0
Standard deviation	0.7	0.3	0.5	0.4	0.4	0.2	0.5
Minimum	12.3	13.2	12.8	13.2	13.0	12.8	12.9
Maximum	14.2	14.0	13.7	14.3	13.9	13.3	14.4
Test weight, kg/hl							
Weighted mean	80.5	80.5	81.2	81.5	81.7	82.3	79.9
Standard deviation	1.0	0.6	0.5	0.7	0.5	0.2	1.7
Minimum	79.1	80.1	80.8	80.3	81.3	82.1	77.1
Maximum	81.4	81.5	81.7	82.2	82.8	82.5	82.5
Wheats of other classes, %							
Weighted mean	0.26	0.21	0.31	0.29	0.44	0.27	0.94
Cereal grains other than wheat, %							
Weighted mean	0.22	0.31	0.18	0.25	0.22	0.17	0.50

* Canadian Grain Commission, Industry Services data for official loading samples tested at time of loading

Methods used at the Grain Research Laboratory

Back to Canada Western Red Spring wheat list of tables and figures

Table 6 • No. 1 Canada Western Red Spring wheat
Pacific export cargo composites
First and second quarters 1996–97

	No. 1 CWRS						
	Guaranteed minimum protein content						
Quality parameter*	14.5	14.0	13.5	13.0	12.5	12.0	11.5
Wheat							
Weight per 1000 kernels, g	31.9	31.9	32.4	32.6	32.8	33.0	33.2
Protein content, %	14.6	14.1	13.6	13.2	12.7	12.3	11.6
Protein content, % (dry matter basis)	16.9	16.3	15.7	15.3	14.7	14.2	13.4
Ash content, %	1.54	1.52	1.51	1.48	1.46	1.47	1.52
α-amylase activity, units/g	5.5	11.5	8.0	7.5	9.5	6.0	6.0
Falling number, s	400	350	380	385	380	395	385
PSI	57	53	52	53	51	51	49
Milling							
Flour yield							
Clean wheat basis, %	75.3	75.3	75.4	75.9	75.3	75.0	75.7
0.50% ash basis, %	76.8	76.3	75.9	75.9	73.8	75.0	75.7
Flour							
Protein content, %	14.2	13.7	13.0	12.8	12.0	11.6	10.9
Wet gluten content, %	38.5	37.4	35.6	34.9	32.3	31.0	28.7
Ash content, %	0.47	0.48	0.49	0.50	0.53	0.50	0.50
Crude colour	-1.7	-1.6	-1.8	-1.8	-1.9	-2.0	-2.2
AGTRON colour, %	66	68	67	68	67	70	70
Starch damage, %	5.9	6.5	6.7	7.2	7.1	7.5	8.0
α-amylase activity, units/g	1.0	3.0	2.5	2.0	2.5	1.5	1.5
Amylograph peak viscosity, BU	795	580	680	680	655	775	690
Maltose value, g/100 g	2.0	2.2	2.1	2.3	2.5	2.6	2.7
Zeleny sedimentation, ml	71	70	68	67	63	62	54
Farinogram							
Absorption, %	66.0	66.4	66.0	66.0	66.0	66.0	66.3
Development time, min	5.75	5.25	5.25	5.0	4.25	4.25	3.25
Mixing tolerance index, BU	25	25	25	25	25	25	30
Stability, min	11.5	9.0	8.5	9.0	8.0	8.0	6.5
Extensigram							
Length, cm	22	21	21	20	20	19	19
Height at 5 cm, BU	310	290	300	300	290	300	280
Maximum height, BU	560	490	505	475	455	460	430
Area, cm^2	165	145	145	135	125	120	115
Alveogram							
Length, mm	139	129	118	108	85	76	63
P (height x 1.1), mm	93	99	108	113	121	132	145
W, x 10^3 ergs	409	399	400	395	360	366	346
Baking (Canadian Short Process Baking Test)							
Absorption, %	70	70	70	70	70	70	70
Mixing energy, W-h/kg	8.1	7.3	8.0	6.9	7.7	8.3	8.0
Mixing time, min	7.3	6.9	7.2	6.9	7.3	10.5	10.3
Loaf volume, cm^3/100 g flour	1150	1095	1095	1110	1025	1050	965

* Unless otherwise specified, data are reported on a 13.5% moisture basis for wheat and a 14.0% moisture basis for flour.

Methods used at the Grain Research Laboratory

Back to

1. Canada Western Red Spring wheat list of tables and figures
2. Quality of Western Canadian Wheat Exports table of contents

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Quality of Western Canadian Wheat Exports
August 1, 1996, to January 31, 1997

Canada Western Red Spring wheat

Tables 7 and 8

Table 7 • No. 2 Canada Western Red Spring wheat
Pacific export cargo composites
First and second quarters 1996–97

	No. 2 CWRS					
	Guaranteed minimum protein content					
Quality parameter*	14.0	13.5	13.0	12.5	12.0	11.5
Wheat						
Weight per 1000 kernels, g	31.8	33.0	32.3	32.9	33.3	33.7
Protein content, %	14.3	13.7	13.1	12.7	12.1	11.6
Protein content, % (dry matter basis)	16.5	15.8	15.1	14.7	14.0	13.4
Ash content, %	1.62	1.60	1.63	1.54	1.54	1.61
α-amylase activity, units/g	8.5	12.0	5.5	9.0	10.0	7.0
Falling number, s	375	360	395	380	380	390
PSI	56	56	54	53	52	52
Milling						
Flour yield						
Clean wheat basis, %	74.8	75.5	75.6	75.1	75.3	74.9
0.50% ash basis, %	75.3	75.5	75.1	74.6	75.3	73.4
Flour						
Protein content, %	13.8	13.0	12.6	12.0	11.5	10.8
Wet gluten content, %	37.6	35.6	34.5	32.2	31.3	28.4
Ash content, %	0.49	0.50	0.51	0.51	0.50	0.53
Grade colour	-1.4	-1.7	-1.8	-2.0	-2.0	-2.3
AGTRON colour, %	63	70	64	68	68	70
Starch damage, %	6.0	6.0	6.7	7.3	7.3	7.4
α-amylase activity, units/g	2.0	3.5	1.5	2.5	2.5	1.0
Amylograph peak viscosity, BU	665	530	705	565	600	690
Maltose value, g/100 g	2.0	2.2	2.4	2.4	2.7	2.7
Zeleny sedimentation, ml	69	68	66	65	62	49
Farinogram						
Absorption, %	65.7	65.3	67.1	66.1	66.4	66.5
Development time, min	5.25	5.25	5.25	4.0	4.0	3.25
Mixing tolerance index, BU	25	30	25	25	25	30
Stability, min	10.0	9.0	10.0	8.0	8.0	7.5
Extensigram						
Length, cm	23	22	20	20	20	19
Height at 5 cm, BU	280	290	300	285	295	270
Maximum height, BU	500	480	480	440	435	400
Area, cm^2	155	150	130	125	120	110
Alveogram						
Length, mm	141	130	89	90	73	62
P (height x 1.1), mm	97	99	125	122	134	143
W, x 10^3 ergs	415	400	383	373	354	327
Baking (Canadian Short Process Baking Test)						
Absorption, %	70	69	71	70	70	70
Mixing energy, W-h/kg	8.7	8.5	8.5	7.3	7.0	6.6
Mixing time, min	7.4	7.3	8.4	7.2	8.1	8.7
Loaf volume, cm^3/100 g flour	1095	1075	1080	1040	985	945

* Unless otherwise specified, data are reported on a 13.5% moisture basis for wheat and a 14.0% moisture basis for flour.

Methods used at the Grain Research Laboratory

Back to Canada Western Red Spring wheat list of tables and figures

Table 8 • No. 3 Canada Western Red Spring wheat
Pacific export cargo composites
First and second quarters 1996–97

Quality parameter*	No. 3 CWRS Not segregated by protein content
Wheat	
Weight per 1000 kernels, g	33.8
Protein content, %	12.1
Protein content, % (dry matter basis)	14.0
Ash content, %	1.61
α-amylase activity, units/g	48.0
Falling number, s	270
PSI	54
Milling	
Flour yield	
Clean wheat basis, %	74.5
0.50% ash basis, %	75.0
Flour	
Protein content, %	11.4
Wet gluten content, %	29.6
Ash content, %	0.49
Grade colour	-1.8
AGTRON colour, %	68
Starch damage, %	7.0
α-amylase activity, units/g	12.0
Amylograph peak viscosity, BU	135
Maltose value, g/100 g	3.1
Zeleny sedimentation, ml	63
Farinogram	
Absorption, %	64.6
Development time, min	3.5
Mixing tolerance index, BU	30
Stability, min	7.0
Extensigram	
Length, cm	19
Height at 5 cm, BU	315
Maximum height, BU	475
Area, cm^2	130
Alveogram	
Length, mm	77
P (height x 1.1), mm	132
W, x 10^3 ergs	365
Baking (Canadian Short Process Baking Test)	
Absorption, %	69
Mixing energy, W-h/kg	7.8
Mixing time, min	8.9
Loaf volume, cm^3/100 g flour	1000

* Unless otherwise specified, data are reported on a 13.5% moisture basis for wheat and a 14.0% moisture basis for flour.

Methods used at the Grain Research Laboratory

Back to:

1. Canada Western Red Spring wheat list of tables and figures
2. Quality of Western Canadian Wheat Exports table of contents

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EXPORT QUALITY REPORTS

Quality of Western Canadian Wheat Exports
August 1, 1996, to January 31, 1997

Canada Western Red Spring wheat

Milling and baking quality
GRL pilot mill

Tables 9 and 10

Composites were prepared from all official loading samples (Atlantic and Pacific) of No. 1 CWRS 13.0 wheat cargoes shipped during the first and second quarters of the 1996-97 crop year. These composites were milled consecutively with the GRL pilot mill to complement laboratory-scale test results.

Figure 1 shows cumulative ash curves computed from the ash content and flour yield of individual millstreams from each milling. A straight-grade flour and a high quality patent flour (prime quality reduction streams representing 60% of total flour) were prepared to allow comparison of wheat milling properties in a commercially relevant fashion as shown in Table 9. The pilot mill flours were also used to evaluate baking quality by a 4.5-hour sponge-and-dough procedure and the Canadian short process-a short, mechanical dough development procedure. Results are shown in Table 10.

Figure 1 • Cumulative ash curves for pilot mill flour

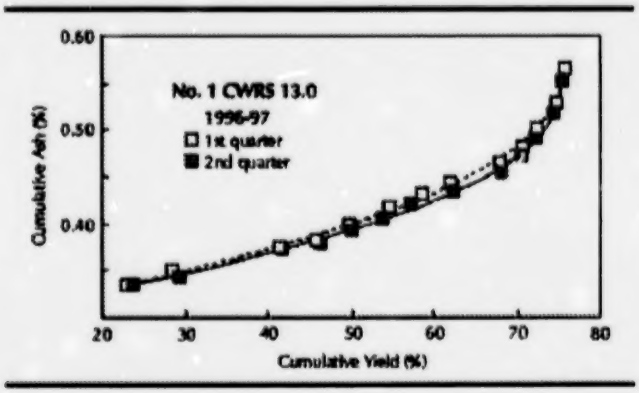

Table 9 • No. 1 Canada Western Red Spring 13.0 wheat
Export cargo composites
Pilot mill flour data • First and second quarters 1996–97

Quality parameter*	Straight-grade		Patent	
	First quarter	Second quarter	First quarter	Second quarter
Flour				
Yield, %	75.7	75.4	45.0	45.0
Protein content, %	13.0	13.0	11.7	11.9
Ash content, %	0.52	0.51	0.37	0.36
Grade colour	-0.4	-0.6	-3.4	-3.4
AGTRON colour, %	58	59	80	82
Starch damage, %	6.3	6.1	6.4	6.2
Amylograph peak viscosity, BU	710	620	865	780
Farinogram				
Absorption, %	64.1	63.8	63.1	62.6
Development time, min	4.75	4.75	5.25	5.25
Mixing tolerance index, BU	35	30	20	20
Stability, min	7.5	7.0	15.0	14.0

* Data are reported on a 14.0% moisture basis.

Methods used at the Grain Research Laboratory

Back to Canada Western Red Spring wheat list of tables and figures

Table 10 • No. 1 Canada Western Red Spring 13.0 wheat
Export cargo composites
Pilot mill flour baking data • First and second quarters 1996–97

Quality parameter	Straight-grade		Patent	
	First quarter	Second quarter	First quarter	Second quarter
Sponge-and-Dough Baking Test	**(40 ppm ascorbic acid)**		**(20 ppm ascorbic acid)**	
Absorption, %	66	66	65	65
Mixing*: energy, W-h/kg	5.2	5.2	6.2	6.0
Mixing*: time, min	5.4	5.8	7.1	6.9
Loaf volume, cm³/100 g flour	1085	1125	1030	1080
Appearance	7.2	7.4	7.0	7.2
Crumb structure	6.0	6.0	5.9	6.0
Crumb colour	8.0	8.0	8.2	8.4
Canadian Short Process Baking Test	**(150 ppm ascorbic acid)**		**(150 ppm ascorbic acid)**	
Absorption, %	68	68	67	67
Mixing: energy, W-h/kg	7.4	7.6	8.4	8.1
Mixing: time, min	6.7	6.5	6.9	6.9
Loaf volume, cm³/100 g flour	1040	1070	1075	1080
Appearance	7.1	7.4	7.5	7.4
Crumb structure	6.2	6.3	6.3	6.3
Crumb colour	8.1	8.0	8.2	8.2

* dough stage

Methods used at the Grain Research Laboratory

Back to:

1. Canada Western Red Spring wheat list of tables and figures
2. Quality of Western Canadian Wheat Exports table of contents

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EXPORT QUALITY REPORTS

Quality of Western Canadian Wheat Exports
August 1, 1996, to January 31, 1997

Canada Western Amber Durum wheat

Canada has an international reputation as a reliable supplier of high quality durum wheat, furnishing about two thirds of the world's exports in recent years. The attributes of Canadian durum that attract demand are reliability of supply, cleanliness, uniformity and consistency within and between shipments, and excellent end-product quality.

Canada has a strong commitment to quality throughout its grain system. This extends to strict varietal control to protect the inherent quality of all grades of amber durum wheat and to strict adherence to wheat grade standards. The requirement that only durum varieties of high intrinsic quality are registered is a cornerstone of the Canadian grading system.

Currently, the predominant variety of Canada Western Amber Durum wheat is Kyle.

Canada Western Amber Durum wheat
Tables 11 and 12

Table 11. Moisture content, test weight and other grade determining factors, Export cargoes of Canada Western Amber Durum wheat

Table 12. Canada Western Amber Durum wheat, Export cargo composites, First and second quarters 1996-97

Table 11 • Moisture content, test weight and other grade determining factors*
Export cargoes of Canada Western Amber Durum wheat
First and second quarters 1996–97

	No. 1 CWAD	No. 2 CWAD	No. 3 CWAD	No. 4 CWAD
Number of cargoes	10	51	17	3
Thousands of tonnes	176	643	237	31
Moisture content, %				
Weighted mean	12.8	13.0	13.6	13.2
Standard deviation	0.3	0.5	0.4	0.3
Minimum	12.2	10.9	13.0	13.1
Maximum	13.1	13.9	14.3	13.6
Test weight, kg/hl				
Weighted mean	82.7	82.2	81.0	81.2
Standard deviation	0.6	0.7	0.7	0.6
Minimum	81.9	80.5	79.8	80.4
Maximum	83.5	83.6	82.2	81.5
Vitreous kernels, %				
Weighted mean	83	70	53	N/A
Wheats of other classes, %				
Weighted mean	1.00	1.17	1.47	2.38
Cereal grains other than wheat, %				
Weighted mean	0.19	0.23	0.33	0.44

* Canadian Grain Commission, Industry Services data for official loading samples tested at time of loading

Methods used at the Grain Research Laboratory

Table 12 • Canada Western Amber Durum wheat
Export cargo composites
First and second quarters 1996-97

Quality parameter*	No. 1 CWAD	No. 2 CWAD	No. 3 CWAD	No. 4 CWAD
Wheat				
Weight per 1000 kernels, g	42.1	44.6	43.0	41.6
Protein content, %	12.0	11.6	11.4	11.3
Protein content, % (dry matter basis)	13.9	13.4	13.2	13.1
SDS sedimentation, ml	30	29	30	27
Ash content, %	1.64	1.55	1.59	1.59
Yellow pigment content, ppm	8.2	8.0	7.6	7.4
Falling number, s	435	415	330	390
α-amylase activity, units/g	4.5	8.0	30.0	12.0
Milling yield, %	72.7	73.7	72.7	71.2
Semolina yield, %	64.2	64.2	62.8	61.1
PSI	38	38	40	42
Semolina				
Protein content, %	11.1	10.6	10.2	10.2
Wet gluten content, %	30.3	29.8	28.4	28.4
Dry gluten content, %	12.2	12.5	11.8	11.5
Ash content, %	0.62	0.60	0.64	0.63
Yellow pigment content, ppm	7.3	6.7	6.6	6.5
AGTRON colour, %	80	79	78	77
Speck count per 50 cm²	4	5	11	18
Falling number, s	500	465	410	475
α-amylase activity, units/g	2.0	3.0	9.0	3.5
Spaghetti				
Dried at 70°C				
Colour				
Brightness, %	52.8	51.7	51.3	51.4
Purity, %	59.0	56.9	56.2	57.1
Dominant wavelength, nm	576.4	576.5	576.6	576.5
Cooking quality, CQP	23	22	21	24

* Unless otherwise specified, data are reported on a 13.5% moisture basis for wheat and a 14.0% moisture basis for semolina.

Methods used at the Grain Research Laboratory

Back to:

1. Canada Western Amber Durum wheat
2. Quality of Western Canadian Wheat Exports table of contents

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EXPORT QUALITY REPORTS

Quality of Western Canadian Wheat Exports
August 1, 1996, to January 31, 1997

Canada Western Red Winter wheat

Canada Western Red Winter (CWRW) wheat is a hard wheat exhibiting excellent milling quality. It is available in two milling grades. Flour produced from high grade CWRW wheat performs well in the production of hearth breads (such as French-style bread) and certain types of noodles, and is also suitable for the production of various types of flat bread, steamed bread and related products.

Production of CWRW wheat is concentrated in the southern region of the province of Alberta where milder winters reduce the incidence of winter kill.

Current varieties eligible for the milling grades of CWRW are Norstar, AC Readymade and CDC Kestral.

Canada Western Red Winter wheat
Tables 13 and 14

Table 13. Moisture content, test weight and other grade determining factors, Export cargoes of Canada Western Red Winter wheat, First and second quarters 1996-97

Table 14. Canada Western Red Winter wheat, Export cargo composite, First and second quarters 1996-97

Table 13 • Moisture content, test weight and other grade determining factors[a]
Export cargoes of Canada Western Red Winter wheat
First and second quarters 1996–97

	No. 2 CWRW
Number of cargoes	2
Thousands of tonnes	14
Moisture content, %	
Weighted mean	11.8
Standard deviation	0.1
Minimum	11.7
Maximum	11.9
Test weight, kg/hl	
Weighted mean	84.6
Standard deviation	0.1
Minimum	84.6
Maximum	84.7
Wheats of other classes, %	
Weighted mean	0.42
Cereal grains other than wheat, %	
Weighted mean	0.24

[a] Canadian Grain Commission, Industry Services data for official loading samples tested at time of loading

Methods used at the Grain Research Laboratory

Table 14 • Canada Western Red Winter wheat
Export cargo composite
First and second quarters 1996–97

Quality parameter*	No. 2 CWRW
Wheat	
Weight per 1000 kernels, g	34.0
Protein content, %	10.7
Protein content, % (dry matter basis)	12.4
Ash content, %	1.45
α-amylase activity, units/g	8.5
Falling number, s	355
Flour yield, %	76.6
PSI	57
Flour	
Protein content, %	10.0
Wet gluten content, %	28.2
Ash content, %	0.44
Grade colour	-2.3
AGTRON colour, %	72
Starch damage, %	6.2
α-amylase activity, units/g	3.5
Amylograph peak viscosity, BU	430
Maltose value, g/100 g	2.3
Zeleny sedimentation, ml	46
Farinogram	
Absorption, %	60.0
Development time, min	3.75
Mixing tolerance index, BU	45
Stability, min	6.5
Extensigram	
Length, cm	20
Height at 5 cm, BU	260
Maximum height, BU	410
Area, cm^2	115
Alveogram	
Length, mm	114
P (height x 1.1), mm	74
W, x 10^3 ergs	262
Baking (Remix-to-Peak Baking Test)	
Absorption, %	59
Remix time, min	2.1
Loaf volume, cm^3/100 g flour	690

* Unless otherwise specified, data are reported on a 13.5% moisture basis for wheat and a 14.0% moisture basis for flour.

Methods used at the Grain Research Laboratory

Back to:

1. Canada Western Red Winter wheat
2. Quality of Western Canadian Wheat Exports table of contents

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Quality of Western Canadian Wheat Exports
August 1, 1996, to January 31, 1997

Canada Prairie Spring Red and White wheat

CPSR

Canada Prairie Spring Red (CPSR) wheat, used alone or in blends, has quality characteristics suitable for the production of various types of hearth breads, flat breads, noodles and related products. The most commonly grown varieties eligible for milling grades of CPSR are Biggar and AC Taber.

CPSW

Canada Prairie Spring White (CPSW) wheat, used alone or in blends, has the quality characteristics suitable for the production of various types of flat breads, noodles, chapatis, crackers and similar products. Current commercial shipments of CPSW wheat consist of only one variety, Genesis, but a new variety, Karma, has recently been released.

Canada Prairie Spring Red and White wheat
Tables 15 and 16

Table 15. Moisture content, test weight and other grade determining factors, Export cargoes of Canada Prairie spring Red and White wheat, First and second quarters 1996-97

Table 15. Canada Prairie Spring Red and White wheat, Export cargo composite, First and second quarters 1996-97

Table 15 • Moisture content, test weight and other grade determining factors*
Export cargoes of Canada Prairie Spring Red and White wheat
First and second quarters 1996–97

	No. 2 CPSR	No. 2 CPSW
Number of cargoes	8	7
Thousands of tonnes	81	55
Moisture content, %		
Weighted mean	13.6	13.6
Standard deviation	0.4	0.3
Minimum	13.0	13.3
Maximum	14.0	14.0
Test weight, kg/hl		
Weighted mean	81.4	81.9
Standard deviation	0.8	0.4
Minimum	80.5	81.5
Maximum	82.8	82.6
Wheats of other classes, %		
Weighted mean	1.40	1.95
Cereal grains other than wheat, %		
Weighted mean	0.55	0.27

* Canadian Grain Commission, Industry Services data for official loading samples tested at time of loading

Methods used at the Grain Research Laboratory

Table 16 • Canada Prairie Spring Red and White wheat
Export cargo composite
First and second quarters 1996–97

Quality parameter*	No. 2 CPSR	No. 2 CPSW
Wheat		
Weight per 1000 kernels, g	41.2	38.8
Protein content, %	10.9	10.8
Protein content, % (dry matter basis)	12.6	12.5
Ash content, %	1.49	1.43
α-amylase activity, units/g	26.5	10.5
Falling number, s	260	350
Flour yield, %	75.4	75.6
PSI	57	61
Flour		
Protein content, %	10.2	10.0
Wet gluten content, %	26.8	28.1
Ash content, %	0.50	0.49
Grade colour	-1.3	-1.2
AGTRON colour, %	72	65
Starch damage, %	6.4	5.0
α-amylase activity, units/g	4.5	4.0
Amylograph peak viscosity, BU	325	510
Maltose value, g/100 g	2.3	1.8
Zeleny sedimentation, ml	45	39
Farinogram		
Absorption, %	61.3	59.9
Development time, min	4.0	3.0
Mixing tolerance index, BU	50	80
Stability, min	6.0	4.0
Extensigram		
Length, cm	20	21
Height at 5 cm, BU	270	230
Maximum height, BU	435	320
Area, cm^2	115	100
Alveogram		
Length, mm	106	123
P (height x 1.1), mm	76	82
W, x 10^3 ergs	255	177
Baking (Remix-to-Peak Baking Test)		
Absorption, %	60	59
Remix time, min	2.3	1.3
Loaf volume, cm^3/100 g flour	670	610

* Unless otherwise specified, data are reported on a 13.5% moisture basis for wheat and a 14.0% moisture basis for flour.

Methods used at the Grain Research Laboratory

Back to:

1. Canada Prairie Spring Red and White wheat
2. Quality of Western Canadian Wheat Exports table of contents

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Quality of Western Canadian Wheat Exports
August 1, 1996, to January 31, 1997

Canada Western Extra Strong wheat

Canada Western Extra Strong (CWES) wheat is a red spring wheat grown primarily in the province of Manitoba. The most widely grown cultivar is Glenlea.

Flour milled from this wheat is characterized by very strong gluten. Dough made from CWES wheat flour cannot be properly developed at the normal farinograph speed of 63 rpm and must be tested at the higher speed of 90 rpm to obtain a true mixing peak.

The strong physical dough properties of CWES wheat make it ideal for blending and for specialty products in which very high gluten strength is needed.

Two milling grades have been established for this class.

Canada Western Extra Strong wheat
Tables 17 and 18

Table 17. Moisture content, test weight and other grading determining factors, Export cargoes of Canada Western Extra Strong wheat, First and second quarters 1996-97

Table 18. Canada Western Extra Strong wheat, Export cargo composite, First and second quarters 1996-97

Table 17 • Moisture content, test weight and other grade determining factors*
Export cargoes of Canada Western Extra Strong wheat
First and second quarters 1996–97

	No. 1 CWES	No. 2 CWES
Number of cargoes	11	1
Thousands of tonnes	49	2
Moisture content, %		
Weighted mean	13.9	12.1
Standard deviation	0.3	–
Minimum	13.2	12.1
Maximum	14.2	12.1
Test weight, kg/hl		
Weighted mean	80.4	81.9
Standard deviation	0.7	–
Minimum	79.1	81.9
Maximum	81.5	81.9
Wheats of other classes, %		
Weighted mean	1.74	5.00
Cereal grains other than wheat, %		
Weighted mean	0.36	0.21

* Canadian Grain Commission, Industry Services data for official loading samples tested at time of loading

Methods used at the Grain Research Laboratory

Table 18 • Canada Western Extra Strong wheat
Export cargo composite
First and second quarters 1996–97

Quality parameter*	No. 1 CWES	No. 2 CWES
Wheat		
Weight per 1000 kernels, g	40.9	42.8
Protein content, %	12.3	11.8
Protein content, % (dry matter basis)	14.2	13.6
Ash content, %	1.59	1.47
α-amylase activity, units/g	8.0	7.5
Falling number, s	355	350
Flour yield, %	75.8	76.5
PSI	50	51
Flour		
Protein content, %	11.9	11.4
Wet gluten content, %	28.3	26.7
Ash content, %	0.58	0.55
Grade colour	-0.5	-0.9
AGTRON colour, %	59	63
Starch damage, %	7.9	8.0
α-amylase activity, units/g	4.0	2.0
Amylograph peak viscosity, BU	440	625
Maltose value, g/100 g	2.8	2.8
Zeleny sedimentation, ml	63	64
Farinogram		
Absorption, %	62.6	63.0
Development time (90 rpm), min	7.0	6.25
Extensigram		
Length, cm	23	23
Height at 5 cm, BU	380	375
Maximum height, BU	720	710
Area, cm^2	225	220
Alveogram		
Length, mm	95	87
P (height x 1.1), mm	111	118
W, x 10^3 ergs	402	402
Baking (Remix-to-Peak Baking Test)		
Absorption, %	64	64
Remix time, min	3.7	4.1
Loaf volume, cm^3/100 g flour	870	825

* Unless otherwise specified, data are reported on a 13.5% moisture basis for wheat and a 14.0% moisture basis for flour.

Methods used at the Grain Research Laboratory

Back to:

1. Canada Western Extra Strong wheat
2. Quality of Western Canadian Wheat Exports table of contents

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EXPORT QUALITY REPORTS

Quality of Western Canadian Wheat Exports
August 1, 1996, to January 31, 1997

Canada Western Soft White Spring wheat

Canada Western Soft White Spring (CWSWS) wheat is a lower protein, soft wheat with weak dough properties. Flour milled from this wheat is suitable for producing cookies, cakes, biscuits and related products. Alone or in blends with stronger wheat, CWSWS wheat can also be used to produce crackers, flat breads, steamed breads and certain types of noodles.

Most CWSWS wheat is grown under irrigation to maximize yield and minimize protein content.

Canada Western Soft White Spring wheat
Tables 19 and 20

Table 19. Moisture content, test weight and other grade determining factors, Export cargoes of Canada Western Soft White Spring wheat, First and second quarters 1996-97

Table 20. Canada Western Soft White Spring wheat, Export cargo composites, First and secord quarters 1996-97

Table 19 • Moisture content, test weight and other grade determining factors*
Export cargoes of Canada Western Soft White Spring wheat
First and second quarters 1996–97

	No. 2 CWSWS
Number of cargoes	2
Thousands of tonnes	16
Moisture content, %	
Weighted mean	12.7
Standard deviation	0.2
Minimum	12.5
Maximum	12.8
Test weight, kg/hl	
Weighted mean	81.4
Standard deviation	0.2
Minimum	81.2
Maximum	81.5
Wheats of other classes, %	
Weighted mean	1.22
Cereal grains other than wheat, %	
Weighted mean	0.19

* Canadian Grain Commission, Industry Services data for official loading samples tested at time of loading

Methods used at the Grain Research Laboratory

Table 20 • Canada Western Soft White Spring wheat
Export cargo composites
First and second quarters 1996–97

Quality parameter*	No. 2 CWSWS
Wheat	
Weight per 1000 kernels, g	34.9
Protein content, %	10.0
Protein content, % (dry matter basis)	11.6
Ash content, %	1.61
α-amylase activity, units/g	10.0
Falling number, s	320
Flour yield, %	74.9
PSI	69
Flour	
Protein content, %	9.2
Wet gluten content, %	24.6
Ash content, %	0.50
Grade colour	-0.7
AGTRON colour, %	63
Starch damage, %	3.2
α-amylase activity, units/g	3.5
Amylograph peak viscosity, BU	465
Maltose value, g/100 g	1.3
Zeleny sedimentation, ml	20
AWRC, %	63.6
Farinogram	
Absorption, %	54.6
Development time, min	1.25
Mixing tolerance index, BU	170
Stability, min	1.5
Alveogram	
Length, mm	90
P (height x 1.1), mm	24
W, x 10^3 ergs	43
Cookie Test	
Spread, mm	80.6
Ratio (spread/thickness)	8.1

* Unless otherwise specified, data are reported on a 13.5% moisture basis for wheat and a 14.0% moisture basis for flour.

Methods used at the Grain Research Laboratory

Back to:

1. Canada Western Soft White Spring wheat
2. Quality of Western Canadian Wheat Exports table of contents

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Quality of Western Canadian Wheat Exports
August 1, 1996, to January 31, 1997

Methods and definitions

At the Grain Research Laboratory (GRL), unless otherwise specified,

- Analytical results for wheat are reported at 13.5% moisture content.
- Analytical results for flour and semolina are reported at 14.0% moisture content.
- AACC methods cited are from The American Association of Cereal Chemists (AACC): Approved Methods of the Association, Ninth Edition, 1995.
- ICC methods cited are those of the International Association for Cereal Science And Technology.

Methods and definitions

(A-D), (E-I), (M-R), (S-T), (W-Z)

AGTRON colour
The AGTRON colour of flour and durum wheat semolina is determined using AACC Method 14-30. An AGTRON direct reading reflectance spectrophotometer is used.

Alveogram
ICC Standard Method No. 121 is followed, using the constant pressure Chopin Alveograph Model MA82.

alpha-amylase activity
The alpha-amylase activity of wheat and flour is determined by the method of Kruger and Tipples (1981), Cereal Chemistry 58:271-274.

Amylograph peak viscosity
Sixty-five grams of flour and 450 ml of distilled water are used with the Brabender Amylograph and the pin stirrer. Other details are as in AACC Method 22-10. Peak viscosity is reported in Brabender units.

Ash content
To determine flour ash content, AACC Method 8-01 is used.

AWRC (Alkaline Water Retention Capacity)
AWRC is determined using AACC Method 56-10.

Canadian Short Process Baking Test
The Canadian Short Process Baking Test is carried out as described by Preston et al. (1982), Canadian Institute of Food Science and Technology Journal 15:29-36. For this test and for the Sponge-and-Dough Baking Test, loaves are produced from 200 g of flour in baking pans with cross-sectional dimensions similar to those of Canadian commercial baking pans. Loaf volume is reported for each 100 g of flour.

Cereal grains other than wheat
Cereal grains other than wheat in wheat are rye, barley, oats, triticale, oat groats and wild oat groats. The percentage of other cereal grains present is determined by handpicking from a subsample of at least 250 g from each increment sample. After a cargo has been loaded, the weighted average of the results is calculated. The amount of other cereal grains found is reported as a percentage by weight without reference to moisture content.

Cookie Test
The Cookie Test is performed according to AACC Method 10-50 D.

Crop year
The Canadian crop year begins on August and ends July 31 the following year.

- First quarter, August 1 to October 31
- Second quarter, November 1 to January 31
- Third quarter, February 1 to April 30
- Fourth quarter, May 1 to July 31

Dockage
Dockage is material that can be removed by approved cleaning equipment. Canadian cargoes must be free of dockage, unless the buyer agrees in writing to accept grain containing dockage.

Dry gluten content
Dry gluten content is determined according to the Glutomatic System Operation manual.

Back to top

Extensigram
Doughs are made from 300 g flour, 6 g salt, and distilled water equal to Farinograph absorption less 2.0% (for example, 65.0% reduced to 63.0%). The adjustment in Farinograph absorption is to compensate both for the salt and for the substitution of the large stainless steel farinograph bowl. Doughs are mixed for one minute and rested for five minutes. Mixing continues until the curve is centred about the 500 Brabender Unit line. Curves are drawn for duplicate doughs at 45 and at 135 minutes, although doughs are rounded and shaped at 90 minutes. Average curves for 45 and 135 minutes are reproduced, but measurements are reported only for the 135-minute curve. Length is in centimetres, height is in Brabender Units, and area is in square centimetres. The extensigraph is set so that 100 Brabender Units equal a 100-g load.

Falling number
The falling number is determined on a 7-g sample of ground wheat or semolina by AACC Method 56-81B. A 300-g sample of wheat is ground in a Falling Number Laboratory Mill 3100 according to ICC Standard Method No. 107.

Farinogram
Fifty grams of flour are mixed in a small stainless steel farinograph bowl at 63 rpm for 15 minutes with enough distilled water to give a maximum dough consistency centred about the 500 Brabender Unit line. Farinograph absorption is the amount of water that must be added to flour to give the required consistency. It is reported as a percent. Dough development time is the time required for the curve to reach its maximum height. For CWES, Farinograph absorption is determined at 63 rpm and dough development time is measured at 90 rpm. For additional details, see the Farinograph Handbook, AACC, 1960.

Flour yield
Wheat is cleaned, scoured and tempered overnight to optimum moisture as described by Dexter and Tipples (1987), Milling 180(7):16. All millings at the GRL are performed in rooms with environmental control maintained at 21øC and at 60% relative humidity.

- Common wheat is milled on an Allis-Chalmers laboratory mill using the GRL sifter flow as described by Black et al. (1980), Cereal Foods World 25:757-760. Flour yield is expressed as a percentage of cleaned wheat on a constant moisture basis. For CWRS wheat, flour yield also is expressed at a constant ash content of 0.50%, as described by Dexter and Tipples (1989), Milling 182(8):9-11. The procedure for pilot milling is described by Fajardo et al. (1995), Cereal Chemistry 72:291-298.
- Durum wheat is milled on a four stand Allis-Chalmers mill in conjunction with a laboratory purifier as described by Black (1966), Cereal Science Today 11:533. The mill flow is described by Dexter et al. (1990), Cereal Chemistry 67:405-412. Semolina is defined as having less than 1% pass through a 149-micron sieve. Semolina yield and milling yield (which includes semolina and flour combined) are reported as a percentage of the cleaned wheat on a constant moisture basis.

Grade colour
A colour index is obtained by the procedure of Kent-Jones, Amos, Martin, Scott and Elias (1956), Chem. and Ind. 1490-93. The procedure uses the automated Satake Series IV Colour Grader, which gives the relative reflectance of a flour-water slurry. Results are standardized to the Satake International Units-the lower the number, the brighter the colour.

Hard vitreous kernels
Determination of hard vitreous kernels (HVK) is made according to Memorandum No. 95-5 of Industry Services, Canadian Grain Commission. A sieved 25-g sample is examined externally for the natural translucency associated with hardness. Bleached kernels may be cut transversely to determine vitreousness.

Incremental sample
As vessels are loaded at terminal and transfer elevators, a series of samples is taken at specific intervals by a mechanical grain sampler. These are called incremental samples.

Back to top

Maltose value
Maltose value is determined according to AACC Method 22-16.

Moisture content (flour)
To determine the moisture content of flour, a 10-g sample is heated for one hour in a semi-automatic Brabender oven at 130°C.

Moisture content (wheat)
Industry Services determines the moisture content of wheat on individual cargoes, and the Grain Research Laboratory determines the moisture content of wheat on grade composites using the Model 919 moisture meter calibrated against the AACC method 44-15A subsection 2-stage (130°C air-oven).

PSI (particle size index)
PSI is a measure of the hardness of a wheat kernel. AACC Method No. 55-30 is modified by using a UDY Cyclone Sample Mill fitted with a feed rate regulator and a 1.0-mm screen. A 10-g sample from 22 g of ground, blended wheat is sieved in a US Standard 200-mesh sieve for 10 minutes in a Ro-tap sieve shaker. The weight of throughs X 10 is recorded as the PSI.

Protein content (N x 5.7)
Protein content of the composite samples is determined by Combustion Nitrogen Analysis (CNA). Protein content (total nitrogen) is determined on a LECO Model FP-428 Dumas CNA analyzer calibrated with EDTA. Samples are ground on a UDY Cyclone Sample Mill fitted with a 1.0-mm screen. A 250-mg sample is analyzed as received (it is not dried before analysis). Moisture is determined by the AACC Method No. 44-15A (Single stage air oven).

The CGC previously used the Kjeldahl method, but switched to CNA on August 1, 1996, after evaluating the method for two years.The CNA method is becoming the world standard for protein determination. The method is

- More environmentally acceptable because it uses no corrosive or potentially toxic chemicals
- Safer because it does not use hot liquids
- More economical to install and to use because it requires no drainage or fume exhaust
- More precise than the Kjeldahl method
- Suitable for sample sizes of up to 300 mg, which can be used with today's instruments, and which create less sampling error than the samples of only a few milligrams used with older instruments

The Dumas test extracts about 2% more nitrogen than the Kjeldahl test.Consequently, the results for any given wheat sample may be higher by 0.2-0.3 percentage units. The difference between CNA and Kjeldahl results increases with increasing protein content.

Remix-to-Peak Baking Test
The Remix-to-Peak Baking Test is a modification of the Remix Baking Test of Irvine and McMullan (1960), Cereal Chemistry 37:603-613, as described in detail by Kilborn and Tipples (1981), Cereal Foods World 26:624-628. Dough is mixed to peak consistency at the second mixing stage.

Back to top

Sampling cargoes
As vessels are loaded at terminal and transfer elevators, a series of samples is taken at specific intervals by a mechanical grain sampler. Canadian grain is cleaned to export specification at terminal elevators before it is shipped. Canadian cargoes must be free of dockage, unless the buyer agrees in writing to accept grain containing dockage.

1. Each sample, referred to as an incremental sample, represents the grain loaded during the interval. Incremental samples are analyzed for commercial cleanliness, visual quality, total foreign material, and non-visual criteria such as test weight, moisture and protein content.

2. An official loading record for the cargo is generated from the data for all incremental samples taken.

3. Representative samples are taken for each grain and grade loaded to a vessel. These representative samples are combined to achieve a weighted average composite sample.

- One subsample is kept by Industry Services as the official loading sample for the shipment.
- A second subsample is sent to the GRL for compositing of weighted grade average samples on which milling, baking and analytical tests are performed.

4. Vessel shipments of No. 1 and No. 2 CWRS wheat are further segregated by guaranteed level of protein content. Each individual sample representing the grain and protein level loaded into a vessel during a prescribed time interval is thoroughly mixed and tested for protein content at the port using near-infrared spectroscopy. The protein result is verified by the CNA procedure. These samples are used by the GRL to prepare the weighted composite samples used for the publication of quality data.

SDS sedimentation values
SDS sedimentation values are determined by the method of Axford and Redman (1979), Cereal Chemistry 56:582, using 3% SDS.

Spaghetti
Spaghetti is processed from semolina on a Demaco laboratory-scale continuous extrusion press as described by Matsuo et al. (1978), Cereal Chemistry 55:744, and dried at 70øC as described by Dexter et al. (1981), Journal of Food Science 46:1741.

Spaghetti colour
Whole strands of spaghetti are mounted on white cardboard for colour measurements. Dominant wavelength, purity and brightness are determined using the Ten Selected Ordinates method, with a Beckman DU-7 spectrophotometer.

Spaghetti cooking quality
Spaghetti cooking quality is determined as described by Dexter and Matsuo (1977), Canadian Journal of Plant Science 57:717-727.

Speck count
Speck count is determined as described by Dexter and Matsuo (1982), Cereal Chemistry 59:63.

Sponge-and-Dough Baking Test
The Sponge-and-Dough Baking Test is based on a 4.5-hour 70% sponge system as described by Kilborn and Preston (1981), Cereal Chemistry 58:198-201.

Starch damage, %
Starch damage is determined using AACC Method 76-31 Damaged Starch: Spectrophotometric Method. Starch damage is expressed as as a percentage of flour weight. The method is also referred to as the MegaZyme method. Conversion factors for alternate methods are

AACC 76-30A = 1.5662 * MegaZyme - 0.338
Farrand = 6.6092 * MegaZyme - 11.972

Test weight
Test weight is determined using the Ohaus 0.5-litre measure, a Cox funnel to standardize the pouring rate, and a striker to level the contents of the 0.5-litre measure. The grain in the container is weighed using an electronic scale. The weight in grams is electronically converted to test weight in kilograms per hectolitre. Upon request, test weight can be determined using the Schopper Chondrometer equipped with the one litre container. The weight in grams of the measured litre of wheat is divided by 10. The result is reported without reference to the moisture content.

Back to top

Weight per 1000 kernels
Broken kernels and foreign material are handpicked from a sample to create a cleaned sample. The number of kernels in a 10-g subsample of the cleaned sample is then counted using an electronic seed counter.

Wet gluten content
ICC Standard Method No. 137 is followed using the Glutomatic System with metal sieves.

Note: When the GRL changed from the Theby Gluten washer, which was no longer available, to the Glutomatic in 1988, the buffer composition (salt, phosphate, pH 6.7) was maintained and dough mixing time was set at 30 seconds when testing common wheat flours. Under these conditions results were comparable to those obtained previously over many years using the Theby machine.

Effective August 1, 1996, we decided to change to exactly the conditions specified in ICC Standard Method No. 137 (20 seconds dough mixing time; salt-phosphate buffer pH 5.95) for common wheat flours. Results obtained using this changed procedure are significantly lower; for example, by up to 5 percentage units for CWRS.

Pilot mill results on composite samples of 1 CWRS 13.0 for 1996 and 1995 milled and tested in 1996, indicated no difference in wet gluten values between the two years.

No changes have been made to the wet gluten procedure used for durum wheat semolina.

Wheats of other classes
Wheats of other classes refers to all classes or types of wheat other than the predominant class. The percentage of wheat of other classes present is determined by hand-picking from a subsample of at least 25 g of each increment sample. After a cargo has been loaded, the weighted average of the results is calculated, without reference to moisture content.

W-h/kg

Watt-hours per kilogram. A measure of mixing energy used in the Canadian Short Process Baking Test.

Yellow pigment content
Yellow pigment content of durum wheat and semolina is determined using AACC Method 14-50.

Zeleny sedimentation
Zeleny sedimentation is determined according to AACC Method 56-60 for flour. Results are reported in millilitres.

Back to top

Back to Quality of Western Canadian Wheat Exports table of contents

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Last updated: June 25, 1997